



Commonwealth of Virginia

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MEMORANDUM

TO: All Members of the Stormwater Management Development/Design Community, All Local Virginia Stormwater Management Program Administrators

FROM: Mike Rolband

DATE: June 22, 2023

RE: Updates to the Virginia Runoff Reduction Method & Total Phosphorus Load of New Development Projects—DRAFTS for Informal Public Comment

I. Introduction

The Virginia Stormwater Management Program (VSMP) Regulation provides for the use of the Virginia Runoff Reduction Method (VRRM) by persons engaged in land-disturbing activity to demonstrate compliance with water quality requirements.ⁱ The VSMP Regulation currently incorporates the VRRM dated March 28, 2011, by referenceⁱⁱ and DEQ accepts results from its 2017 update to the VRRM.ⁱⁱⁱ The VSMP Regulation also limits the total phosphorous load of new development projects to 0.41 pounds per acre per year, which is calculated using the VRRM.^{iv}

Consistent with requirements in the Stormwater Management Act to periodically modify minimum design criteria for measures to control nonpoint source pollution so they reflect current engineering methods,^v and the VSMP Regulation to review the water quality design criteria standards upon completion of the 2017 Chesapeake Bay Phase III Watershed Implementation Plan (Phase III WIP),^{vi} the Virginia Department of Environmental Quality (DEQ) contracted with Virginia Tech to evaluate and update the VRRM and total phosphorus load of new development projects.

The purpose of this memorandum is to provide an overview of the proposed updates to the VRRM and total phosphorus load. In addition, DEQ is announcing the opening of an informal 60-day public comment period. DEQ will use the comments it receives to inform future efforts to incorporate the revised VRRM and total phosphorus load into

the regulation that will combine the erosion and sediment control and stormwater management programs as required by the 2016 Consolidation Bill.^{vii}

Anyone wishing to submit comments on the proposed updates to the VRRM or total phosphorus load may do so by email to DEQ at SWMguidance@deq.virginia.gov. All comments must be received by August 21, 2023 and include your name, organization represented (if any), mailing address and/or email address.

II. Overview of Updates

Compared to VRRM Version 3.0 (2017), Version 4.0 contains the following updates:

- A. Expanded land covers: Separates the existing forest/open space land cover into individual “forest” and “mixed open” land covers and establishes runoff curve numbers for A, B, C, and D Hydrologic Soil Groups (HSGs) for each.
- B. Alignment with the Chesapeake Assessment Scenario Tool (CAST): Assigns the applicable number of 49 CAST land uses to four VRRM land covers and uses CAST loading rates to update VRRM land covers.
- C. Addresses changes to the Chesapeake Bay Watershed Model (CBWM), reported through CAST, regarding urban phosphorus fertilizer applications: Derives VRRM loading rates from a CBWM scenario that better represents reduced fertilizer applications on managed turf due to Virginia’s ban on phosphorus fertilizer sales and use,^{viii} compared to existing model runs. The proposed loading rates for land covers in Version 4.0 are shown in Table 1. Details on the fertilizer analysis, and corresponding CBWM scenario, are described in the *Compliance Spreadsheet User’s Guide & Documentation* Appendix E (page 101).
- D. Accommodates new post-development Best Management Practices (BMPs): Accommodates two additional BMPs, Regenerative Stormwater Conveyance (RSC) and Trees, which are currently under development through the Virginia Stormwater Management Handbook Stakeholder Advisory Group (SAG).^{ix} The SAG may add additional post-development BMPs and/or revise the removal rate percentages for the BMPs that will be included in the forthcoming Virginia Stormwater Management Handbook. The removal rate percentages for post-development BMPs will be consistent between Version 4.0 and the Handbook so some removal rates may change when the Handbook is finalized..
- E. The proposed total phosphorus load for new development is 0.26 lbs/acre/yr: Reflects the projected mix of land to be developed in Virginia’s Chesapeake Bay watershed based on recently analyzed and published data in the U.S. Geologic Survey’s (USGS) Chesapeake Bay Land Use and Land Cover Database.^x Virginia Tech revised Version 4.0 to use the USGS dataset based on feedback from the SAG. Virginia Tech compared current aggregated land use data and average loading rates for total phosphorus to calculate the proposed 0.26 lbs/acre/yr standard. The

standard reflects the continuing trend of an increasing percentage of forested/natural land (81%) that is converted for development relative to the percentage of additional agricultural land (19%) that is converted.^{xi,xii} Additional details about the target value are in the *Compliance Spreadsheet User's Guide & Documentation* Appendix F (page 108).

III. Effect of Updates to the VRRM and Total Phosphorus Load

To summarize the current (VRRM Version 3.0) and proposed (VRRM Version 4.0) required phosphorus removal efficiency using the updated phosphorus loading rates, DEQ is providing Table 1. Note that impervious total phosphorus loads have been reduced significantly in the current CBWM, and that change is reflected in Table 1. While significantly different, the values are supported by recent independent monitoring by Virginia Tech and likely due to the benefits of the Clean Air Act which has reduced both dry fall deposition of total phosphorus as well as rain drop total phosphorus concentrations. Additionally, while the effect of the Virginia Phosphorus Ban in lawn fertilizer is now utilized in these loads from managed turf, total phosphorus loads from managed turf are still much greater than in the previous version of VRRM and approach or exceed impervious total phosphorus loading rates. Forest rates are relatively the same and mixed open are in between the forest and managed turf rates (as expected).

Table 1: VRRM land covers and phosphorus loading rates (lbs/acre/yr) for different HSGs.

VRRM Version	Land Cover	A	B	C	D
3.0	Forest/Open Space	0.050	0.070	0.090	0.110
	Managed Turf	0.340	0.460	0.500	0.570
	Impervious	2.170	2.170	2.170	2.170
4.0	Forest	0.042	0.062	0.083	0.104
	Mixed Open	0.239	0.341	0.385	0.454
	Managed Turf	0.479	0.639	0.703	0.799
	Impervious	0.794	0.794	0.794	0.794

To compare the current (VRRM Version 3.0) and proposed (VRRM Version 4.0) required phosphorus removal efficiency using the updated phosphorus loading rates and total phosphorus load of new development projects (0.26 lbs/acre/yr), Virginia Tech ran 68 scenarios of post-development land cover iterations (e.g., varying percentages of forest, turf, and impervious cover) for new development on a 3-acre example site with varying land covers. Virginia Tech also ran 68 scenarios for redevelopment on a 0.8-acre example site, a 3-acre example site, and a linear 7-acre example site. The results are shown in Figures 1 through 4 below. The results show, overall, that the required removal rates are similar. They are slightly higher when managed turf dominates a land use and slightly lower when impervious cover dominates. The linear project examples show lower required removal rates, primarily due to the new land use of mixed open in lieu of managed turf in a significant portion of the site areas.

Figure 1: Comparison of current (VRRM Version 3.0) and proposed (VRRM Version 4.0) required phosphorus removal efficiency for an example, 3-acre new development site.

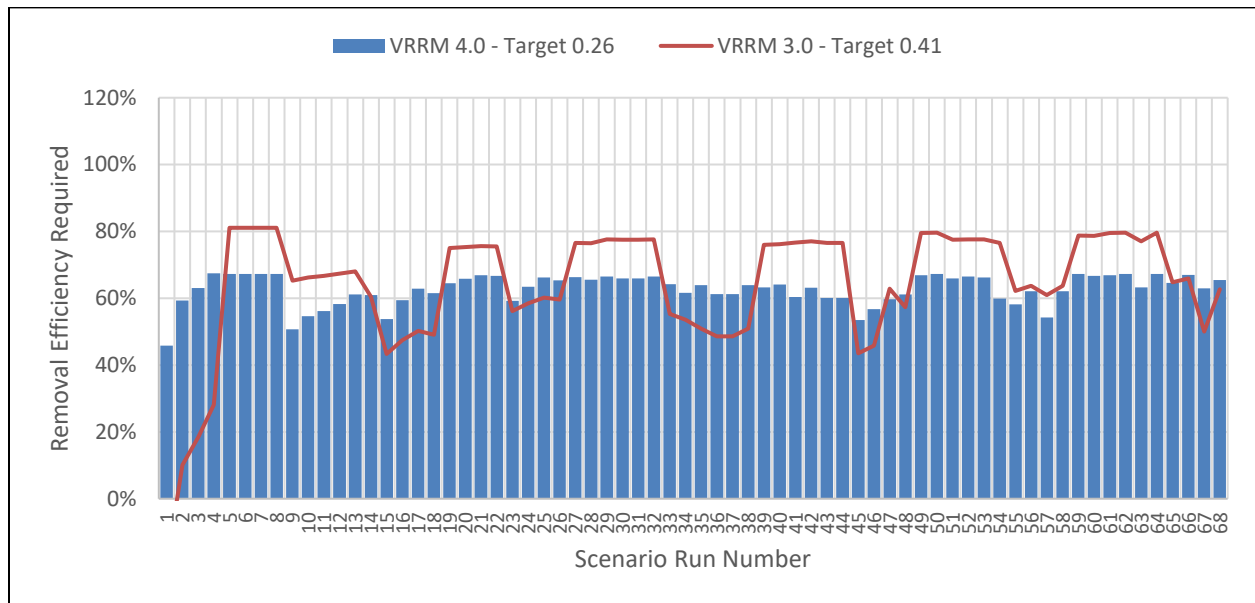


Figure 2: Comparison of current (VRRM Version 3.0) and proposed (VRRM Version 4.0) required phosphorus removal efficiency for an example, 3-acre redevelopment site.

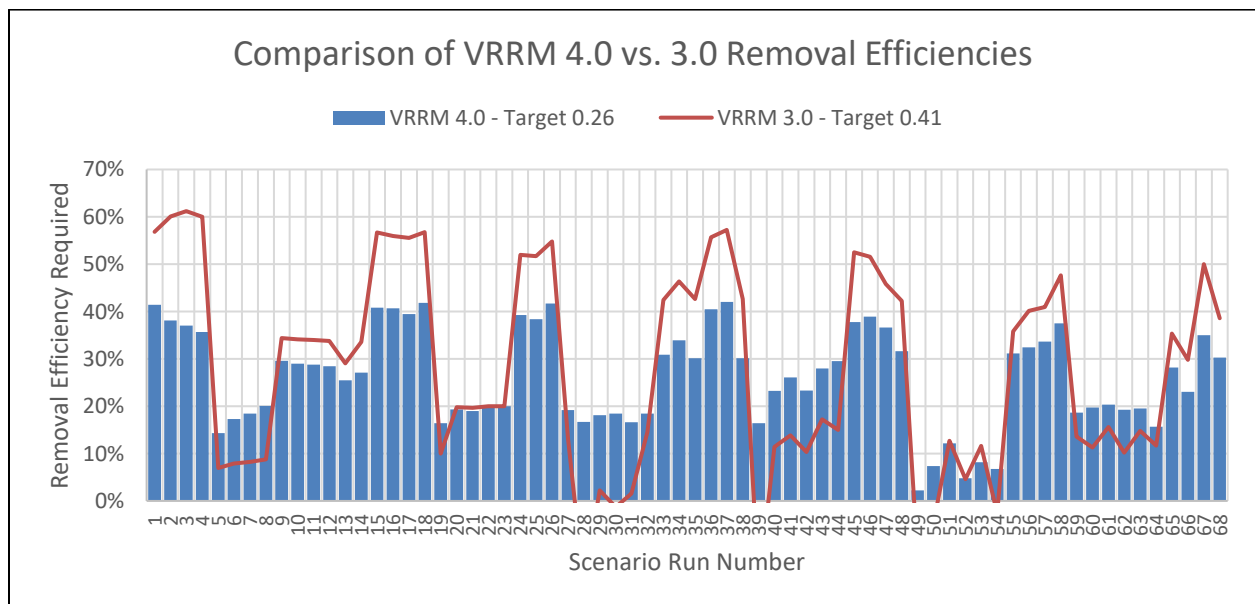


Figure 3: Comparison of current (VRRM Version 3.0) and proposed (VRRM Version 4.0) required phosphorus removal efficiency for an example, 0.8-acre redevelopment.

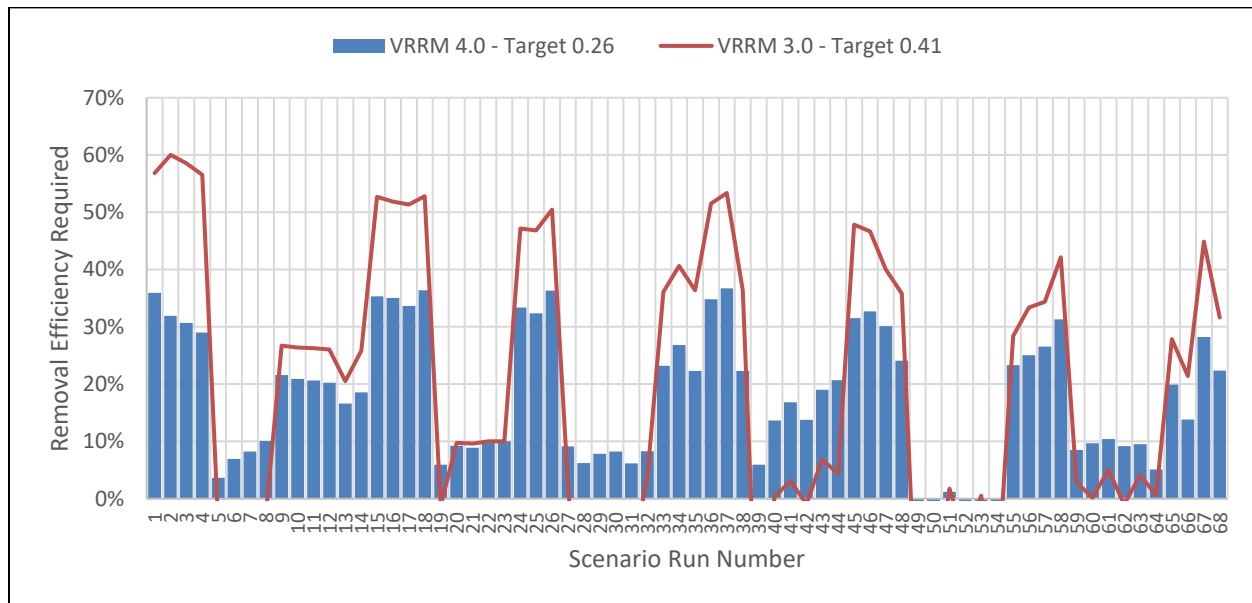
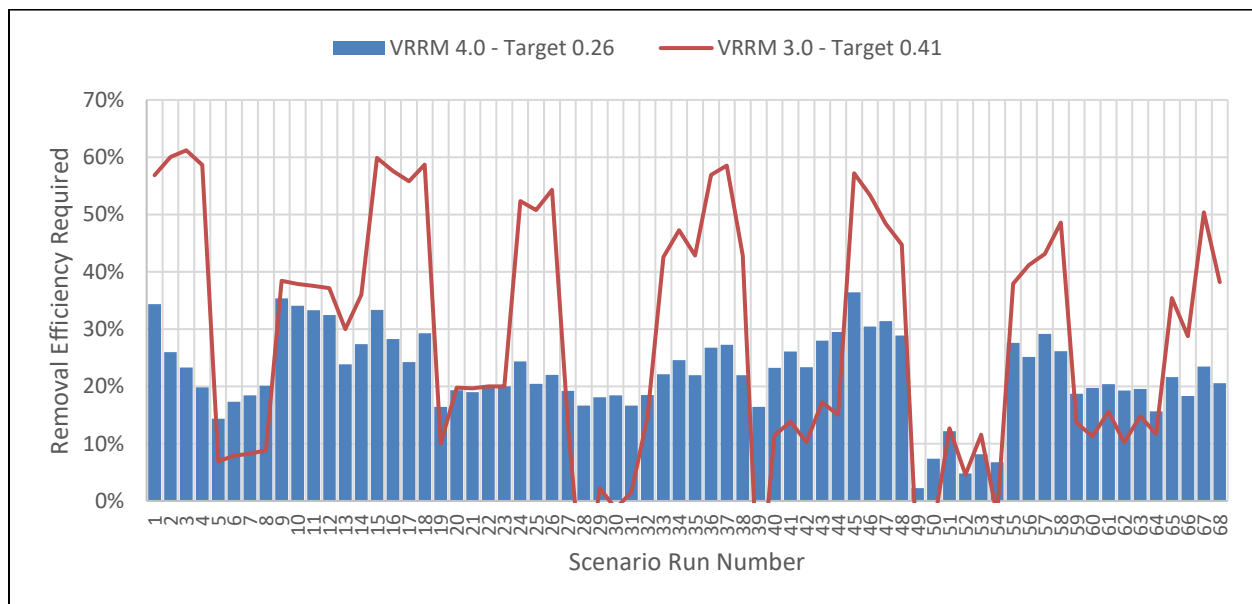


Figure 4: Comparison of current (VRRM Version 3.0) and proposed (VRRM Version 4.0) required phosphorus removal efficiency for an example, 7-acre linear redevelopment.



If DEQ formally adopts the updates, they will establish a replicable relationship between CAST and VRRM that will facilitate reporting progress toward the goals of Virginia's Chesapeake Bay Total Maximum Daily Load (TMDL) Watershed Implementation Plan. In addition, DEQ will no longer need to research and update certain constant values such as Event Mean Concentration, because such values are addressed within the CBWM and updated through the Chesapeake Bay Program's

deliberative partnership process. Regarding updates, DEQ will simply need to request or run CAST scenarios and input results into the VRRM compliance spreadsheets. Further, as the forthcoming Virginia Stormwater Management Handbook is finalized and undergoes future updates, any associated changes to pollutant removal efficiencies or other BMP information will be incorporated into future updates to the VRRM.

IV. DEQ's Multi-Prong Stormwater Strategy

These updates to the VRRM and total phosphorus load provide the latest effort by DEQ to improve and enhance its stormwater programs. The Agency's multi-pronged strategy also includes making information more readily available online, issuing critical guidance, consolidating the Erosion and Sediment Control Regulations and Virginia Stormwater Management Program (VSMP) Regulation, and developing and issuing the Virginia Stormwater Management Handbook which will update and consolidate existing guidance, manuals, and handbooks.

Thank you for reviewing the proposed updates to the VRRM and total phosphorus load and sharing your comments with DEQ.

ⁱ 9VAC25-870-65. Water quality and other technical requirements in the VSMP Regulation will be carried forward in their current form to the Virginia Erosion and Stormwater Management Regulation, which is scheduled to be effective July 1, 2024 (see note vii), concurrent with this update to the VRRM.

ⁱⁱ Documents Incorporated by Reference (9VAC25-870). Available at: <https://law.lis.virginia.gov/admincode/title9/agency25/chapter870/section9999/>.

ⁱⁱⁱ Guidance Memo (GM) No. 16-2001 - Updated Virginia Runoff Reduction Method Compliance Spreadsheets - Version 3.0 (May 2, 2016). Available at: <https://townhall.virginia.gov/L/ViewGDoc.cfm?gdid=6090> and <https://swbmp.vwrrc.vt.edu/vrrm/>.

^{iv} 9VAC25-870-63 A.

^v Code of Virginia § 62.1-44.15:28 A 2.

^{vi} 9VAC25-870-63 C. In addition, Initiative 48 in the Phase III WIP requires DEQ to “initiate a review of the post-development water quality design criteria requirements established under the VSMP Regulation, 9VAC25-870-63.” Aug. 23, 2019. Pp. 76.

^{vii} Chapters 68 and 758 of the 2016 Acts of Assembly, referred to as the “Consolidation Bill.” The ninth enactment requires the State Water Control Board to adopt regulations to implement the acts. Chapters 665 and 666 of the 2023 Acts of Assembly direct the State Water Control Board to adopt regulations to implement the Consolidation Bill before July 1, 2024 and set the effective date of the regulations and bill as July 1, 2024. DEQ will present the regulations required by the Consolidation Bill to the State Water Control Board for approval at its June 22, 2023 meeting. The regulations, the Virginia Erosion and Stormwater Management Regulation, 9VAC25-875, will replace and repeal the Erosion and Sediment Control Regulations, 9VAC25-840, the Erosion and Sediment Control and Stormwater Management Certification Regulations, 9VAC25-850, and the Virginia Stormwater Management Program (VSMP) Regulation, 9VAC25-870.

^{viii} See 2011 Acts of Assembly Chapter 341 and Code of Virginia §§ 3.2-3607 et seq.

^{ix} The specifications for RSC and Trees BMPs are currently under development and subject to change. For the purpose of public comment, VRRM Version 4.0 uses placeholder data regarding pollutant removal efficiencies. In addition, allowable use of the BMPs may change (e.g., allowable placement in treatment trains, etc.).

^x Chesapeake Bay Program, 2023, Chesapeake Bay Land Use and Land Cover (LULC) Database 2022 Edition: U.S. Geological Survey data release, <https://doi.org/10.5066/P981GV1L>.

^{xi} Virginia Tech initially applied a 20% factor of safety to the nutrient target value to be consistent with VRRM Version 3.0 and account for potential model errors and limitations in estimating the natural/forest and agricultural conversions rates in CAST. With this revision to VRRM Version 4.0, Virginia Tech did not use the 20% factor of safety due to the quality of the USGS land conversion dataset and the fact that better data resulted in almost the same nutrient target value, 0.26 lbs/acre/yr vs. 0.27 lbs/acre/yr.

^{xii} The percentages are more heavily weighted for forest to development conversion than in the current CBWM. Weighting is based on comments from the Virginia Stormwater Management Handbook SAG. Further, DEQ understands that the CBWM will be updated with these or similar land use data. The weighting is a significant change because the initial target was based on a projected land use conversion to development from forest of 36%, and to agriculture of 64%.